



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

27572 7590 06/16/2009

HARNES, DICKEY & PIERCE, P.L.C.
P.O. BOX 828
BLOOMFIELD HILLS, MI 48303

EXAMINER

FORDE, DELMA ROSA

ART UNIT

PAPER NUMBER

2828

DATE MAILED: 06/16/2009

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10791,377	03/02/2004	Marcos Dantus	6550-000057/CPE	8952
TITLE OF INVENTION: LASER SYSTEM USING ULTRA-SHORT LASER PULSES				

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0	\$1055	09/16/2009

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. **PROSECUTION ON THE MERITS IS CLOSED.** THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN **THREE MONTHS** FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. **THIS STATUTORY PERIOD CANNOT BE EXTENDED.** SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax **(571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

27572 7590 06/16/2009
HARNESS, DICKEY & PIERCE, P.L.C.
P.O. BOX 828
BLOOMFIELD HILLS, MI 48303

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10791,377	03/02/2004	Marcos Dantus	6550-000057/CPE	8952
-----------	------------	---------------	-----------------	------

TITLE OF INVENTION: LASER SYSTEM USING ULTRA-SHORT LASER PULSES

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0	\$1055	09/16/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
FORDE, DELMA ROSA	2828	372-030000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a **Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE _____ (B) RESIDENCE: (CITY and STATE OR COUNTRY) _____

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____
Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.**

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/791,377	03/02/2004	Marcos Dantus	6550-000057/CPE	8952
27572	7590	06/16/2009	EXAMINER	
HARNESS, DICKEY & PIERCE, P.L.C. P.O. BOX 828 BLOOMFIELD HILLS, MI 48303			FORDE, DELMA ROSA	
			ART UNIT	PAPER NUMBER
			2828	

DATE MAILED: 06/16/2009

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 108 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 108 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Notice of Allowability**Application No.**

10/791,377

Applicant(s)

DANTUS ET AL.

Examiner

DELMA R. FORDE

Art Unit

2828

- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 09/16/2008.
2. ☒ The allowed claim(s) is/are 1-16, 20, 22, 26-70, 77-80 and 92-123.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
(a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
(b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date 02/12/2009 and 04/14/2009
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/DELMA R. FORDE/
Examiner, Art Unit 2828

/Minsun Harvey/
Supervisory Patent Examiner, Art Unit 2828

DETAILED ACTION

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Monte Falcoff on June 2, 2009.

The application has been amended as follows:

Claims read as:

1. A system comprising:

- a) a laser operable to emit a femtosecond laser beam pulse;
- b) a phase shaper operable to shape the pulse with binary phase values; and
- c) a controller operable to automatically control the laser and the shaper, the controller including software instructions operable causing and controlling multiphoton intrapulse interference in the laser beam pulse.

15. A system comprising:

- a) a laser beam pulse;

- b) a phase shaper operable to shape the laser beam pulse with encoded characteristics and with binary phase value;
- c) a nonlinear optical medium operable to separate multiple frequencies of the pulse;
- d) software instructions operable causing and controlling multiphoton intrapulse interference in the laser beam pulse;
- e) a detection device operable to detect the characteristics of the shaped laser beam pulse as separated by the nonlinear optical medium; and
- f) a unit connected to the device operably decoding the characteristics.

26. A system for use with living tissue, the system comprising:

- a high peak intensity laser beam pulse;
- software instruction operable causing and controlling multiphoton intrapulse interference in the laser beam pulse;
- a device operable to change a characteristic of the pulse prior to emission of the pulse upon the living tissue through use of multiphoton intrapulse interference; and
- wherein nonlinear transitions induced by each pulse are controlled by binary phase shaping and the software instructions.

34. A system for multiphoton microscopy, the system comprising:

- a) a femtosecond laser operable to emit a laser pulse;
- b) a target operable to hold a sample in the pulse;
- c) the sample operably labeled with at least one fluorescent probe;
- d) software instructions operable causing and controlling

multiphoton intrapulse interference in the pulse;

- e) a phase shaper operable to shape the pulse in the binary manner to cause selective excitation of the probe and to correct for phase distortions; and

- f) a detector operably detecting an emission from the sample.

41. The system of claim 40, wherein the controller is part of a microprocessor, and the controller controls multiphoton intrapulse interference in the pulse with binary pulse values used with the binary phase shaper

47. A method for microscopy of a target material containing probes that are excitable by multiphoton multi-photon excitation, the method comprising:

- a) generating a laser pulse;
- b) using programmable instructions to cause and control

multiphoton intrapulse interference in the pulse;

- c) shaping the pulse using a binary phase shaper employing binary phase functions so that the pulse selectively excites a desired probe by the multiphoton excitation;
- d) directing the shaped pulse at the target; and
- e) detecting emissions from the target.

53. A method of pulse shaping, the method comprising:

- a) emitting a laser pulse having a duration less than 110 femtoseconds;
- b) directing the pulse into a pulse shaper;
- c) characterization of the pulse using multiphoton intrapulse interference phase software, the software including instructions operable causing and controlling multiphoton intrapulse interference in the pulse if desired; and
- d) shaping the pulse by only two phase values.

77. A method of pulse shaping, the method comprising:

- a) emitting at least one laser pulse;
- b) directing the at least one pulse into a pulse shaper;
- c) shaping the at least one pulse in a binary manner and
- d) characterization of the at least one pulse using multiphoton intrapulse interference phase scan software, the software including

instructions operable to cause and control multiphoton intrapulse interference in the pulse if desired.

78. The method of claim 77, wherein the at least one pulse has a duration less than 51 femtoseconds.

92. A system comprising:

- a laser operably emitting at least one laser beam pulse of less than 51 femtoseconds;

- a pulse shaper operably controlling a spectral phase of the at least one pulse, the shaper shaping the at least one pulse by only two phase values;

- a detector operably detecting a spectrally dispersed second harmonic of the at least one shaped pulse; and

- a controller connected to the shaper and detector, the controller operably controlling multiphoton intrapulse interference in the at least one pulse, the controller being operable to use software instructions to cause and control multiphoton intrapulse interference in the at least one pulse.

93. The system of claim 92 wherein the at least one pulse has a duration less than 10 femtoseconds.

98. The system of claim 92 further comprising a retrieved unknown spectral phase in the at least one pulse in used to calculate a compensation phase that cancels spectral phase distortions in subsequent laser beam pulses.

106. The method of claim 77, further comprising obtaining a second harmonic spectrum of the at least one pulse with a second-harmonic generation crystal and spectrometer.

107. The method of claim 77, further comprising:

- (a) introducing a reference phase function into the at least one pulse by the pulse shaper.
- (b) frequency doubling an output;
- (c) detecting the second harmonic spectrum in a spectrometer;
- (d) determining the phase distortion with a controller and
- (e) subtracting the phase distortion when subsequent phase functions are introduced by the pulse shaper to compensate for phase distortions of the input laser pulse.

110. The method of claim 77, further comprising introducing a binary phase function to the at least one pulse in addition to a compensation phase.

111. A system comprising:

- (a) a laser emitting a laser beam pulse;
- (b) a shaper operably shaping the pulse with binary phase values;
- and (c) a controller including software instructions being operable to cause and control multiphoton intrapulse interference in the pulse with the assistance of the binary phase values.

Withdrawn claims are now rejoined.

Allowable Subject Matter

The following is an examiner's statement of reasons for allowance: The following is an examiner's statement of reasons for allowance: Claims 1, 15, 26, 34, 47, 53, 77, 92 and 111 recites a system structure including the specific structure limitation of *software instructions operably causing multiphoton intrapulse interference to be created in the laser beam pulse*, which is neither anticipated or disclosed nor suggested in any piece of available prior art, which is neither anticipated nor obvious over the prior art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DELMA R. FORDE whose telephone number is (571)272-1940. The examiner can normally be reached on M-T.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MinSun O. Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DELMA R. FORDE/
Examiner, Art Unit 2828

/Minsun Harvey/
Supervisory Patent Examiner, Art Unit 2828